

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Geofizika
Course title:	Geophysics

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Geologija, prva stopnja, univerzitetni	Ni členitve (študijski program)	3. letnik	Letni

Univerzitetna koda predmeta/University course code: 11247

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
30	0	30	0	0	60	4

Nosilec predmeta/Lecturer: Andrej Gosar

Vrsta predmeta/Course type: Obvezni / Compulsory

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Vpis v 3. letnik študija geologije.
Opravljen izpit iz Matematike 1 in Fizike 1 za pristop k izpitu.

Prerequisites:

Inscription to the 3rd year of Course Geology.
Passed exams of Mathematics 1 and Physics 1 to take an exam.

Vsebina:

Uvod. Geofizikalne metode. Pridobivanje, obdelava in interpretacija podatkov. Direktna in inverzna interpretacija.
Gravimetrija. Osnove težnosti. Referenčni sferoid in geoid. Težnostni popravki. Bouguerjava anomalija. Gostote kamnin. Gravimetri in meritve. Obdelava podatkov. Ločevanje težnostnih polj. Interpretacija podatkov: direktna, inverzna (modeliranje). Uporaba grav. metod in primeri. Grav. karte.
Magnetometrija. Osnove magnetizma. Magn. lastnosti kamnin. Notranje in zunanje magn. polje Zemlje. Časovne variacije in korekcije. Magnetometri in meritve. Obdelava podatkov. Kvalitativna in kvantitativna interpretacija. Uporaba magn. metod. Magn. karte.
Goelektrične metode. Osnove električnih in elektromagnetnih polj. Električne lastnosti kamnin. Lastni potencial. Telurika in magnetotelurika. Elektromagnetne metode: pasivne in aktivne. Kvalitativna in kvantitativna interpretacija. Georadar. Upornostne metode. Metoda navidezne specifične upornosti: vertikalno električno sondiranje in kartiranje. Inducirana polarizacija. Pri vsaki metodi: meritve, interpretacija, uporaba in primeri.
Seizmične metode. Elastične lastnosti trdnih snovi. Vrste seizmičnih valov in njihova hitrost v kamninah. Seizmični

Content (Syllabus outline):

Introduction. Geophysical methods. Data acquisition, processing and interpretation. Forward and inverse interpretation.
Gravity methods. Principles of gravity. Reference spheroid and geoid. Gravity corrections. Bouguere anomaly. Density of rocks and minerals. Gravity meters and measurements. Data processing. Separation of gravity fields, regional-residual. Data interpretation: forward and inverse modelling. Application of gravity methods with examples. Gravity maps.
Magnetic methods. Principles of magnetism. Magnetic properties of rocks. Earth's internal and external magnetic field. Temporal variations and their corrections. Magnetometers and measurements. Data processing. Qualitative and quantitative interpretation. Application of magnetic methods with examples. Magn. maps.
Goelectrical methods. Principles of electric and electromagnetic fields. Electric properties of rocks. Self potential method. Telluric and magnetotelluric methods. Electromagnetic methods: passive and active. Qualitative and quantitative interpretation. Ground Penetration Radar. Resistivity methods. Apparent resistivity method, vertical electrical sounding and mapping. Induced polarisation. Acquisition, processing and interpretation of

<p>vir, geofoni, seizmograf. Refleksijska metoda. Korekcije in obdelava refleksijskih podatkov. Geološka interpretacija. Refrakcijska metoda. Terenski postopki in obdelava podatkov. Globoke seizmične raziskave. Seizmična tomografija. Uporaba seizmičnih metod.</p> <p>Geotermija. Viri Zemljine toplote. Prehajanje toplote v Zemlji, kondukcija (prevajanje), konvekcija (strujanje), radiacija (sevanje), advekcija. Geotermalne značilnosti v notranjosti Zemlje. Gostota toplotnega toka. Zemljina toplota in globalna tektonika. Določevanje temperature, geokemične metode, geofizikalne metode. Geotermalna energija.</p>	<p>different electrical and EM methods with examples and applications.</p> <p>Seismic methods. Elastic properties of solid materials. Different types of seismic waves. Seismic velocities in rocks. Seismic sources, geophones and seismographs. Seismic reflection method. Corrections and processing of reflection data. Geological interpretation. Seismic refraction method. Field procedures and data processing. Deep seismic sounding. Seismic tomography. Application of seismic method.</p> <p>Geothermy. Sources of Earth's heat. Transfer of heat in the Earth, conduction, convection, radiation, advection. Geothermal properties in the Earth's interior. Heat Flow Density. Earth's heat and global tectonics. Determination of temperature, geochemical methods, geophysical methods. Geothermal energy.</p>
---	---

Temeljna literatura in viri/Readings:

<p>GOSAR, A., RAVNIK, D. 2007: Uporabna geofizika. Učbenik NTF, 288 p.</p> <p>FOWLER, C.M.R. 2005: The solid earth. An introduction to global geophysics. Cambridge University Press, 2nd ed., 685 p.</p> <p>KAEREY, P., BROOKS, M. 1991: An introduction to geophysical exploration. Blackwell Science, 2nd ed., 254 p.</p> <p>REYNOLDS, J.M. 1997: An introduction to applied and environmental geophysics. John Wiley & Sons, 769 p.</p> <p>TEFORD, W.M, GELDART, L.P., SHERIFF, R.E. 1990: Applied geophysics. Cambridge University Press, 2nd ed., 770 p.</p>
--

Cilji in kompetence:

<p>CILJI:</p> <p>poznavanje najpomembnejših metod uporabne geofizike, poznavanje osnov globalne geofizike in lastnosti geofizikalnih polj, uporaba in načrtovanje geofizikalnih metod pri različnih geoloških raziskavah, zmožnost osnovne obdelave in interpretacije geofizikalnih podatkov.</p> <p>KOMPETENCE:</p> <p>sposobnost uporabe geofizikalnih podatkov, sposobnost vključevanja geofizike v geološke raziskave, sposobnost izvajanja preprostejših geofizikalnih raziskav.</p>	<p>Objectives and competences:</p> <p>OBJECTIVES:</p> <p>knowledge of most important geophysical methods, knowledge of global geophysics and Earth's potential fields , application and planning of geophysical methods in different geological investigations, capability of basic geophysical data processings and interpretation.</p> <p>COMPETENCES:</p> <p>capability to apply geophysical data, capability to include geophysics in geological investigations, capability to perform basic geophysical investigations.</p>
---	---

Predvideni študijski rezultati:

<p>Znanje in razumevanje:</p> <p>fizikalnih polj in valovanj naravnega in umetnega izvora ter njihove uporabe v raziskovalne namene načrtovanja geofizikalnih raziskav za reševanje različnih geoloških problemov</p> <p>izvedbe preprostejših geofizikalnih meritev</p> <p>razumevanje osnovnih fizikalnih zakonov na primeru Zemlje</p> <p>razumevanje principa delovanja posameznih geofizikalnih metod na praktičnih primerih</p> <p>sposobnost fizikalnega obravnavanja geoloških problemov</p> <p>sposobnost sinteze geofizikalnih in geoloških podatkov</p>	<p>Intended learning outcomes:</p> <p>Knowledge and understanding:</p> <p>physical (potential) fields and waves of natural and artificial origin, and their application in geophysical research</p> <p>planning of geophysical investigations for solving different geological problems</p> <p>to perform simple geophysical investigations</p> <p>understanding basic physical principles related to the Earth</p> <p>understanding principles of different geophysical methods on practical examples</p> <p>capability of physical approach to geological problems</p> <p>capability of synthesis of geophysical and geological data</p>
--	---

Metode poučevanja in učenja:	Learning and teaching methods:
predavanja, laboratorijske vaje, računalniške vaje	lectures, laboratory and computer exercises

Načini ocenjevanja:	Delež/Weight	Assessment:
opravljene naloge iz snovi vaj	10,00 %	done coursework
pisni izpit iz snovi vaj	35,00 %	written examination - exercises
pisni izpit iz snovi predavanj	55,00 %	written examination - lectures

Reference nosilca/Lecturer's references:

GOSAR, A. 1998: Seismic-reflection surveys of the Krško basin structure: Implications for earthquake hazard at the Krško nuclear power plant, southeast Slovenia. *Journal of Applied Geophysics*, 39/3, 131-153.

GOSAR, A. 2008: Gravity modelling along seismic reflection profiles in the Krško basin (SE Slovenia). *Geologica Carpathica*, 59/2, 147-158.

GOSAR, A. 2010: Site effects and soil-structure resonance study in the Kobarid basin (NW Slovenia) using microtremors. *Nat. hazards earth syst. sci.*, 10/4, 761-772.

GOSAR, A. 2012: Analysis of the capabilities of low frequency ground penetrating radar for cavities detection in rough terrain conditions: the case of Divača cave, *Slov. Acta carsologica*, 41/1, 77-88.

GOSAR, A., ČERU, T. 2016: Search for an artificially buried karst cave entrance using ground penetrating radar: a successful case of locating the S-19 Cave in the Mt. Konin massif (NW Slovenia). *International Journal of Speleology*, 45/2, 125-147.